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## SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS

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Prepared For:  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

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**TEXAS A&M UNIVERSITY  
REMOTE SENSING CENTER  
COLLEGE STATION, TEXAS**



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# SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS

## 1.0 BACKGROUND AND SUMMARY

### 1.1 Background

This investigation is directed toward testing and modifying a technique developed in a previous study (Contract #5-70251-AG TASK #5) where a linear combination of Landsat data was related to watershed runoff coefficients. The relationship was developed and tested in a region of central Oklahoma where extensive rainfall and runoff data were available for research watersheds.

In this study the technique will be tested in two regions; one in central and east central Texas having more dense vegetation than Oklahoma and the other in arid regions of Arizona and New Mexico where vegetation is less dense. In each region twenty watersheds will be selected on a basis of the most adequate records of rainfall and runoff. The technique will be tested in each region by developing a relationship between spectral response and runoff coefficients based on ten watersheds and then testing the prediction capability of the relationship on the remaining watersheds in that region.

It is expected that by testing the technique in regions having more dense and more sparse vegetation on the watershed surfaces, an estimate can be made of the

area where the technique is applicable. At the same time, the influence of the quality of rainfall and runoff data used to calibrate the prediction scheme should indicate whether the technique can be useful to practicing hydrologists.

## 1.2 Summary

Computer programs were developed to process computer compatible tape (CCT) data to determine the mean spectral reflectance for multispectral scanner (MSS) bands four, five, six and seven of an irregular shaped area (watershed). There are problems in accurately locating an area from CCT's, thus, human interaction with the computer is necessary to obtain the final output.

Data from 27 experimental watersheds in Arizona and New Mexico were collected. Agencies contributing data were listed.

## 2.0 ACCOMPLISHMENTS AND PROBLEM AREAS

### 2.1 Accomplishments

Computer compatible tapes (CCT's) ordered during the previous reporting period were received. Computer programs to convert watershed boundary points from latitude and longitude to records and pixels and to define an irregular area by use of trapezoids were developed and tested. These programs also calculate a watershed's mean spectral reflectance in each of the bands. The programs are currently being utilized to process CCT data to determine reflectance values for the Texas test watersheds.

At one time, it was assumed that the programs could be developed for determining the average spectral reflectance of a watershed automatically by computer. However, as of now the problem of accurately locating the area of interest from CCT's has restricted such procedures. Many of the areas of interest for watershed studies have few readily distinguishable points that can be related to the longitude and latitude. Consequently, the watershed boundary defined by the computer in records and pixels must be shifted on a greymap of the general area by using reference points to accurately delineate the watershed. Since this adjustment must be made, input (records and pixels) for the irregular area program must be determined manually from the greymap. Final computer

output for each watershed is the average spectral reflectance (less water) for the multispectral scanner (MSS) bands four, five, six and seven.

Rainfall and runoff data were collected for 27 experimental watersheds located in Arizona and New Mexico during this reporting period. Contributing agencies were the United States Geological Survey (USGS) at Phoenix, Southwest Rangeland Watershed Research Center at Tucson, University of Arizona Water Resources Research at Tucson, Rocky Mountain Forest and Range Experiment Station at Tempe, and Rocky Mountain Forest and Range Experiment Station at Flagstaff.

Data have been requested for an additional twelve watershed areas in order that test watersheds in Arizona and New Mexico may be selected that are comparable in size. Since storm rainfall in the arid regions is known to be highly localized and very intense in small areas it seems reasonable to use smaller watersheds. A cursory examination of the data reveals major differences in runoff due to climatic differences within Arizona. An attempt will be made to select test areas in a region having a minimum of climatic differences.

## 2.2 Problem Areas

None



## 2.3 Recommendations

None

## 2.4 Accomplishments Expected During the Next Quarter

Analysis of the Texas test watersheds will be completed. Watershed data from Arizona and New Mexico will be processed, and watershed boundaries will be outlined on USGS topographic maps.

## 3.0 SIGNIFICANT RESULTS AND PRESENTATION

### 3.1 Significant Results

None

### 3.2 Presentations

None

## 4.0 FUNDS EXPENDED AND LANDSAT DATA STATUS

### 4.1 Third Quarter Expenditures

### 4.2 Data Expenditures